PHYSICS FOR SCIENTISTS AND ENGINEERS 1 (EE109)

Chapter # 14
Wave

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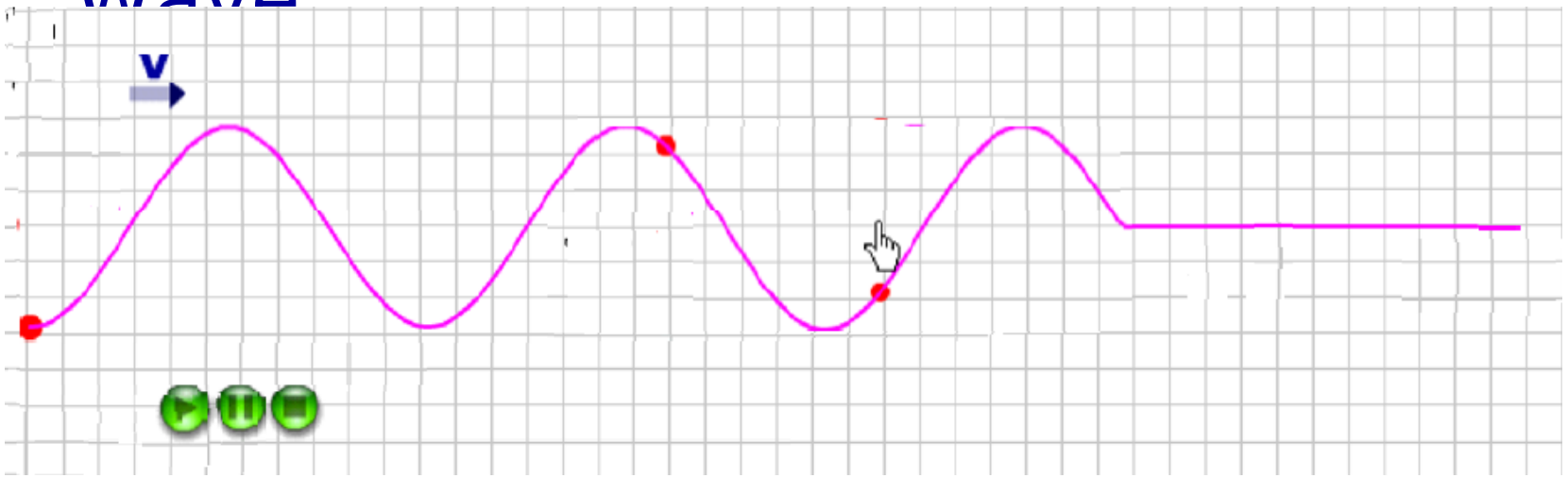
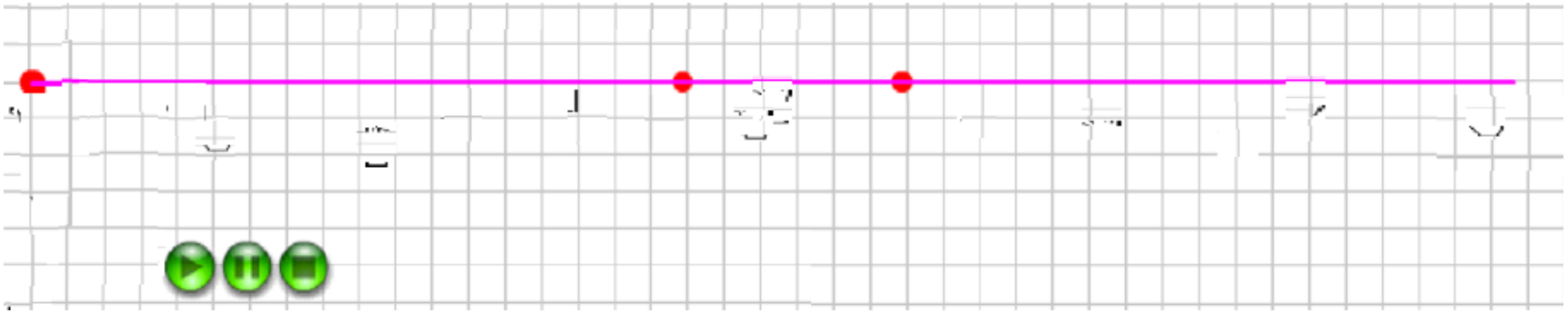
UCSI UNIVERSITY

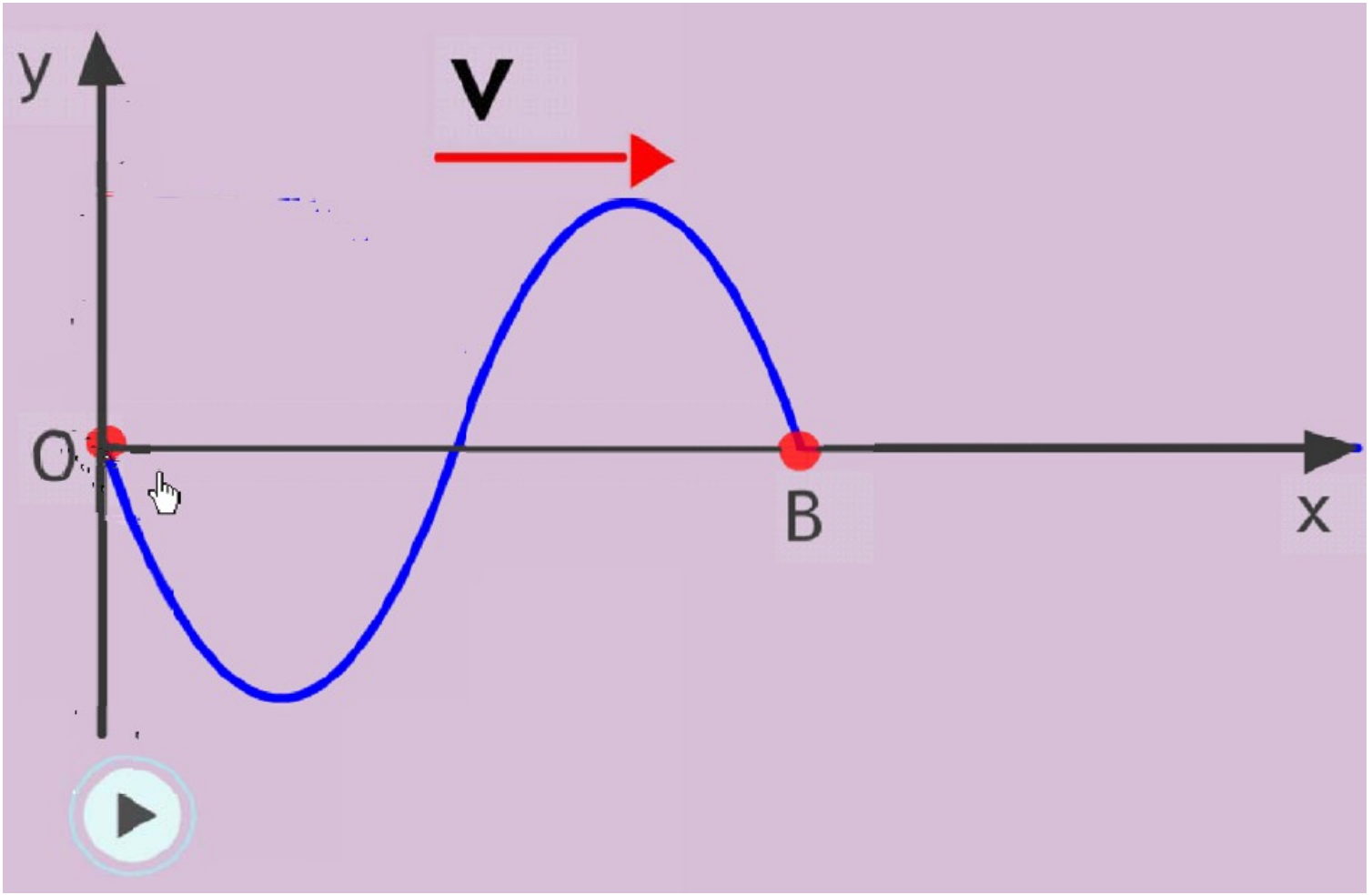
Period of Wave





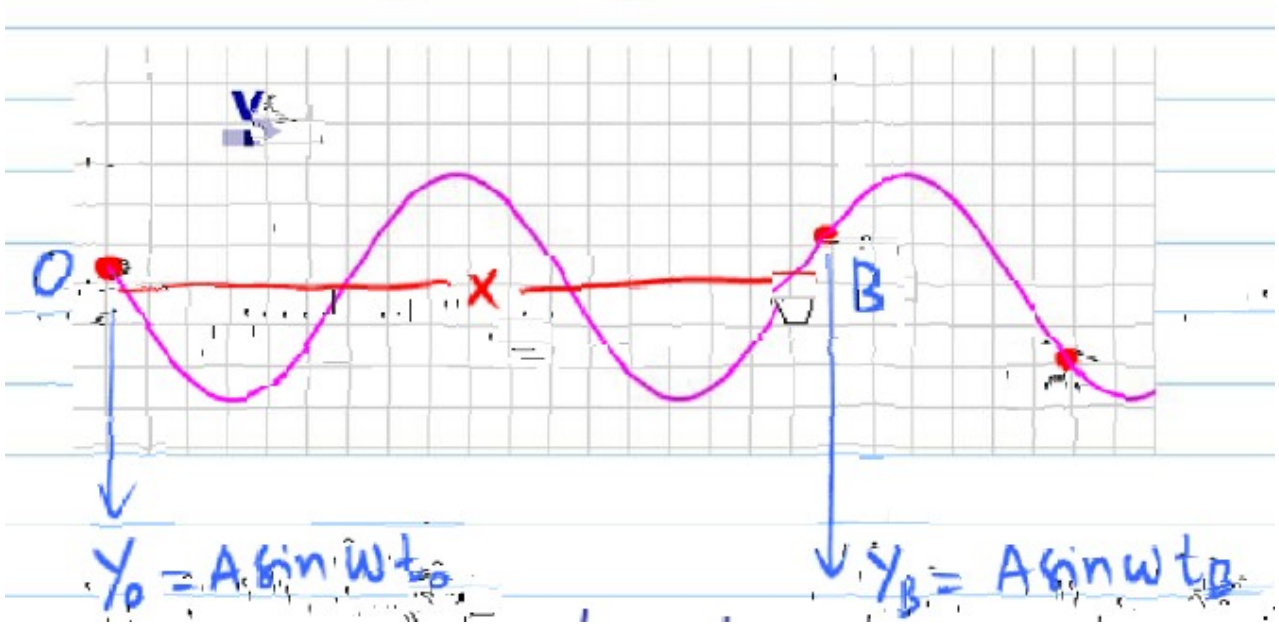
Thermometer :

A liquid –mercury or alcohol- is sealed in a glass capillary tube that has a bulb at one end which serves as a


y
v
O
B
x

The equation of Wave

(movement wave)



$$t_B = t_O - t_{OB} = t_O - \frac{x}{v}$$

$$y_B = A \sin \omega \left(t_O - \frac{x}{v}\right)$$

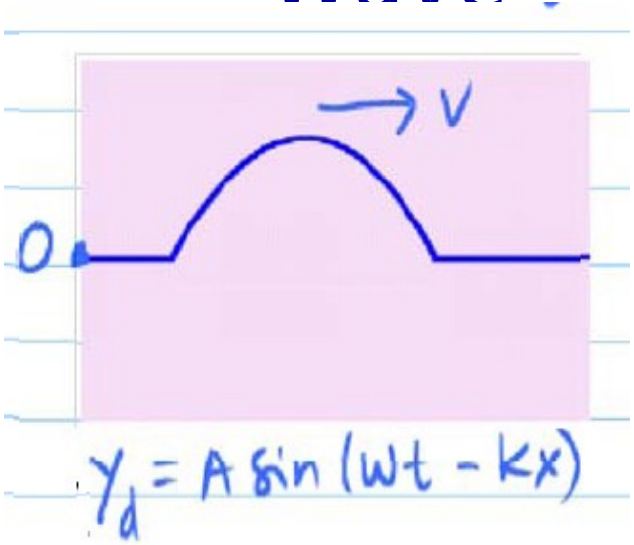
$$y = A \sin \omega \left(t - \frac{x}{v}\right)$$

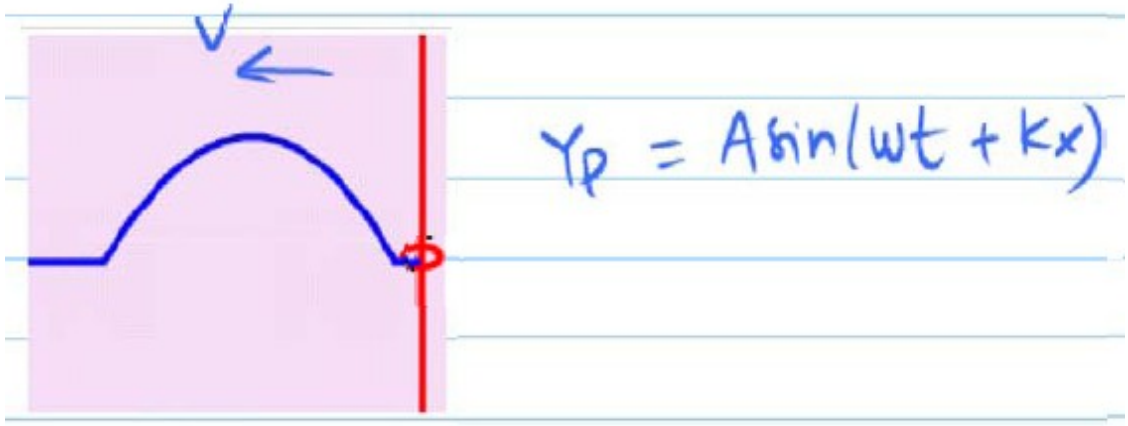
$$= A \sin \left(\omega t - \frac{\omega}{v} x\right)$$

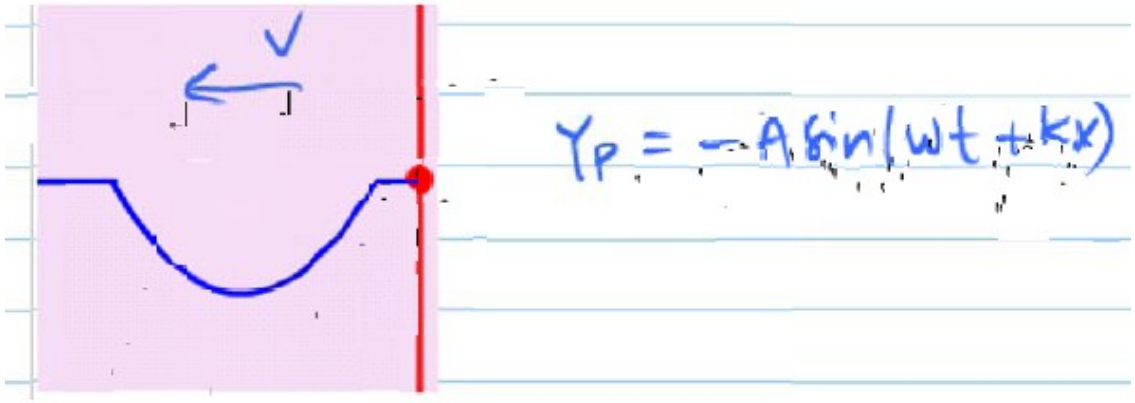
$$= A \sin (\omega t - kx)$$

$$k = \frac{\omega}{v} =$$

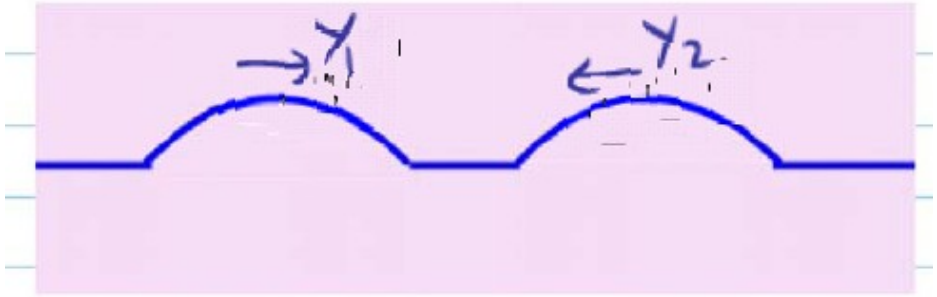
The Reflection of Wave

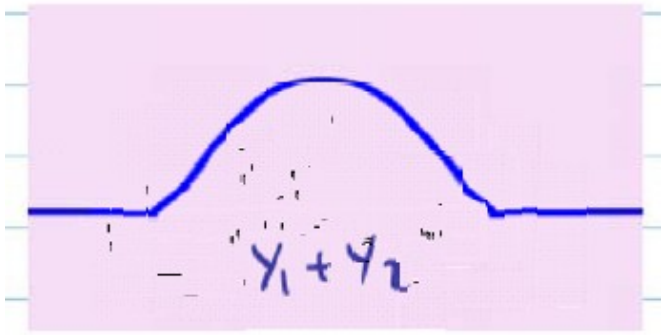


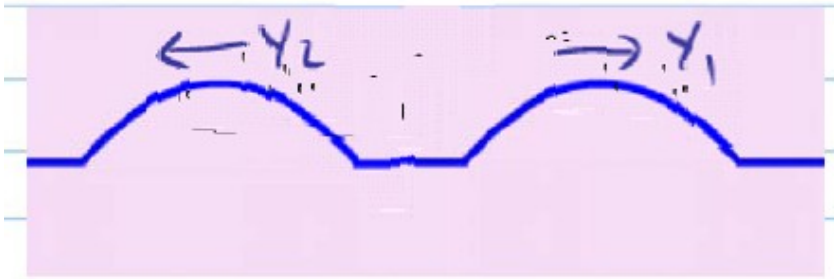




Superposition of Waves

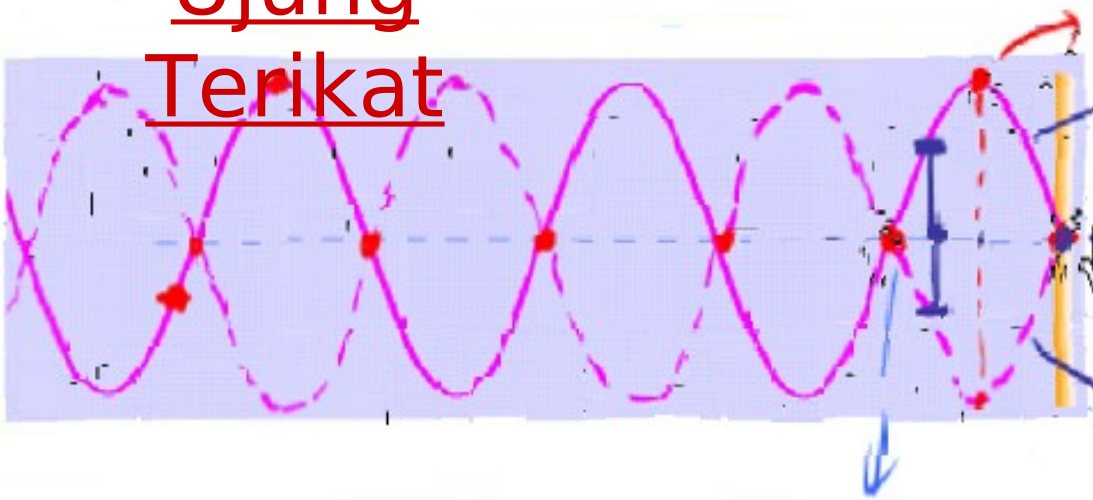






Stationary Wave

Ujung Terikat



$Y_1 = A \sin(\omega t + kx)$

Referenc e

$Y_2 = -A \sin(\omega t - kx)$

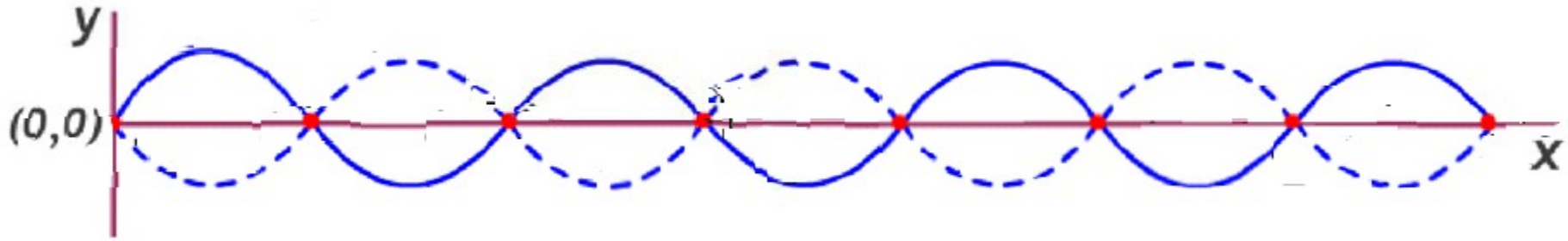
Node

$$Y_s = Y_1 + Y_2$$
$$= A \sin(\omega t + kx) - A \sin(\omega t - kx)$$
$$= 2A \cos \tfrac{1}{2}(2\omega t) \sin \tfrac{1}{2}(2kx)$$
$$= 2A \cos \omega t \sin kx = \underbrace{2A \sin kx} \cos \omega t$$
$$= A_s \cos \omega t$$

Ujung Bebas

$$Y_s = 2A \cos kx \sin \omega t$$
$$= A_s \sin \omega t$$

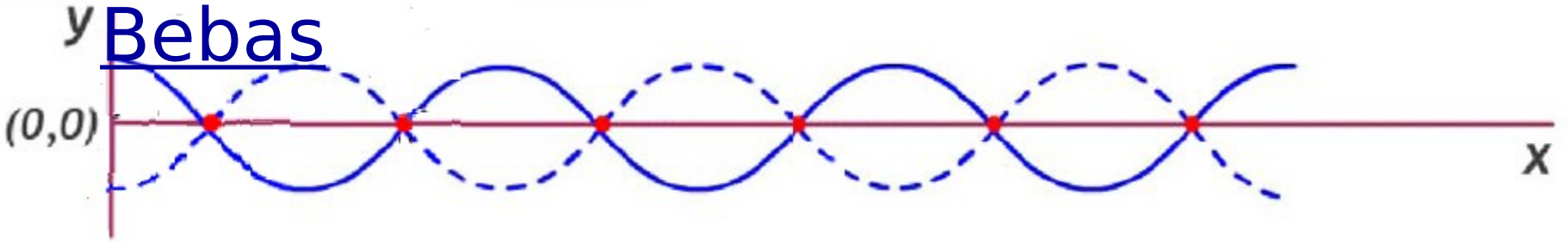
Ujung Terikat



Simpul $x = 0, \frac{1}{2}\lambda, \lambda, 1\frac{1}{2}\lambda, \ldots$

Perut $x = \frac{1}{4}\lambda, \frac{3}{4}\lambda, \frac{5}{4}\lambda, \frac{7}{4}\lambda, \ldots$

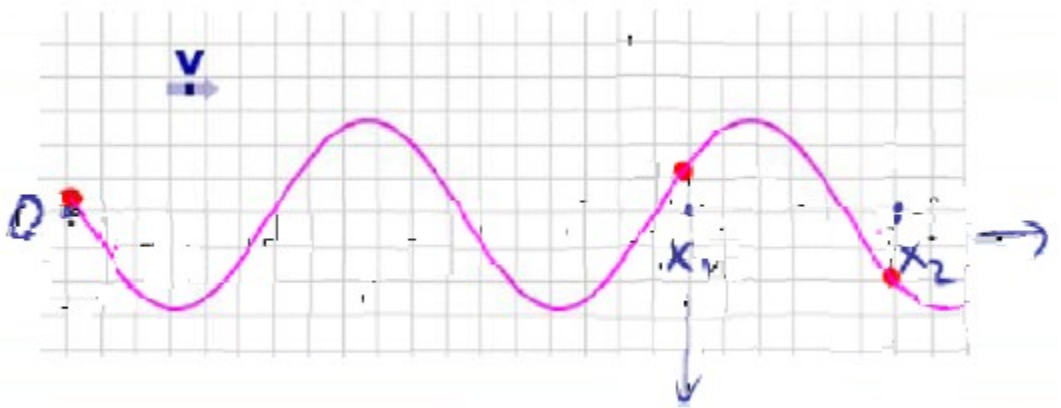
Ujung Bebas



Simpul : $x = \frac{1}{4}\lambda, \frac{3}{4}\lambda, \frac{5}{4}\lambda, \ldots$

Perut : $x = 0, \frac{1}{2}\lambda, \lambda, 1\frac{1}{2}\lambda, \ldots$

Phase



$\rightarrow Y_2 = A\sin(\omega t - kx_2)$

$Y_1 = A\sin(\omega t - kx_1)$

$\Delta\theta = \theta_1 - \theta_2 = (\omega t - kx_1) - (\omega t - kx_2)$

$= kx_2 - kx_1$

$= k(x_2 - x_1) = k\Delta x$

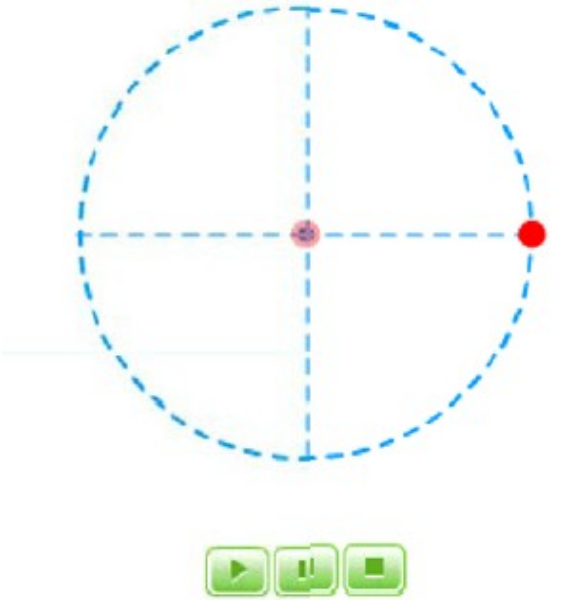
$= \frac{2\pi}{\lambda}\Delta x$

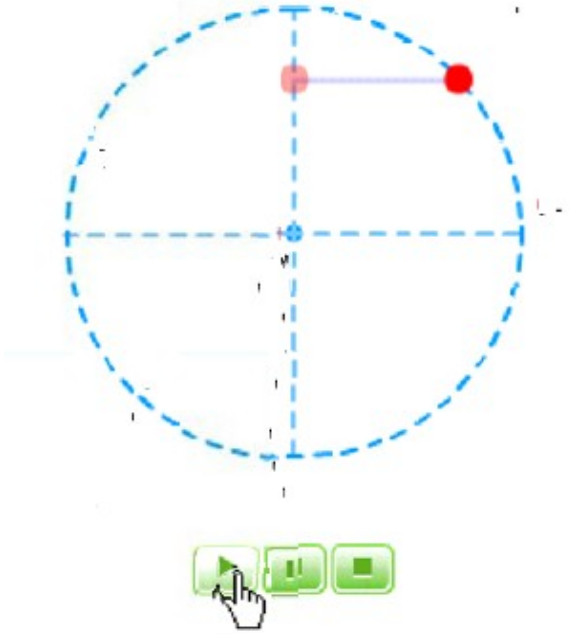
$= 2\pi\frac{\Delta x}{\lambda}$

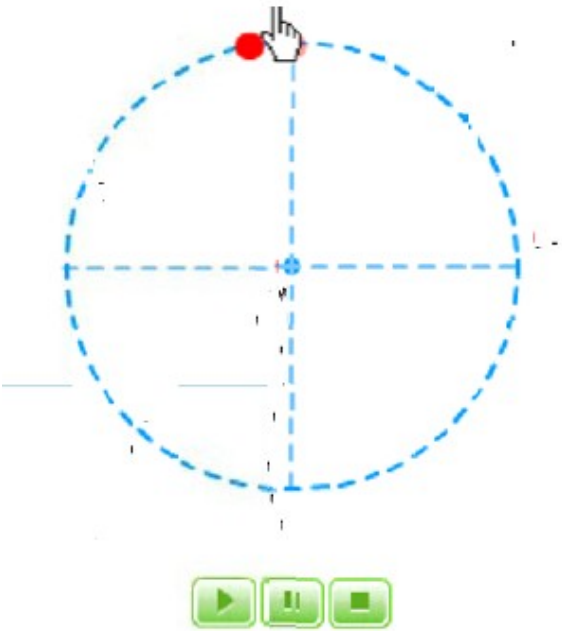
$k = \frac{\omega}{v} = \frac{2\pi}{T \cdot v} = \frac{2\pi}{\lambda}$

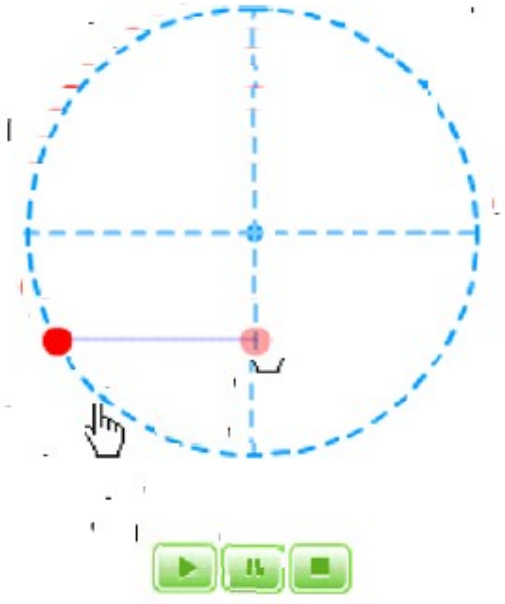
$\Delta\varphi = \frac{\Delta\theta}{2\pi} = \frac{\Delta x}{\lambda}$

Elastic

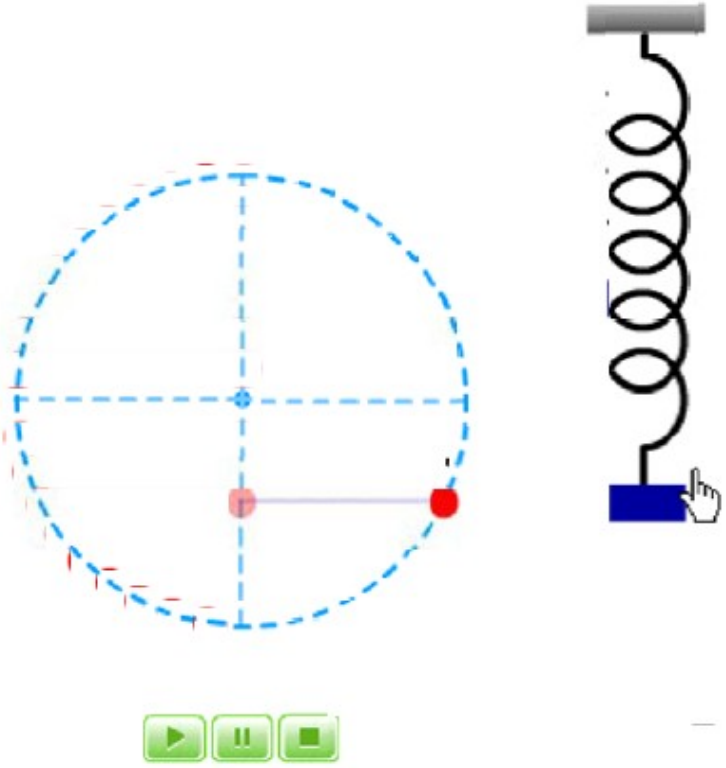


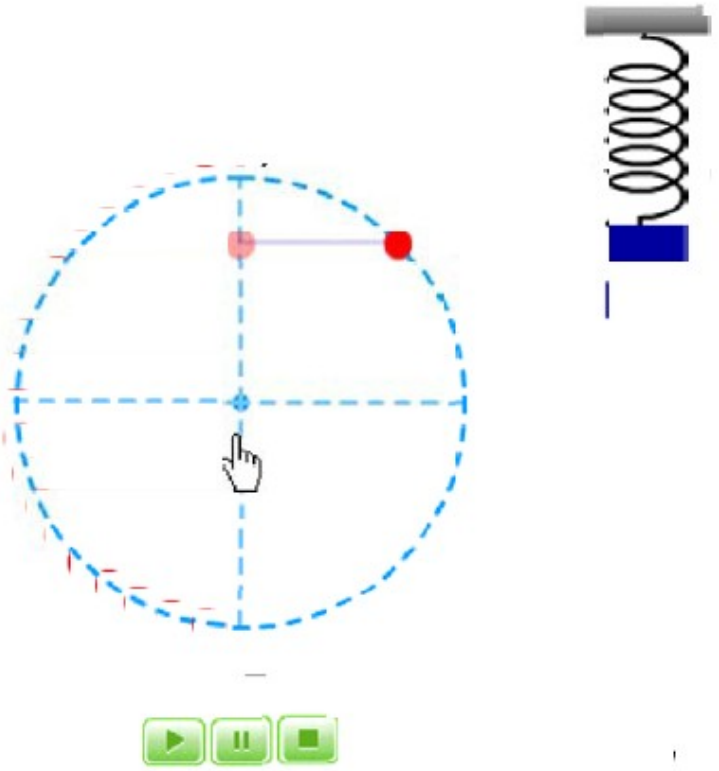




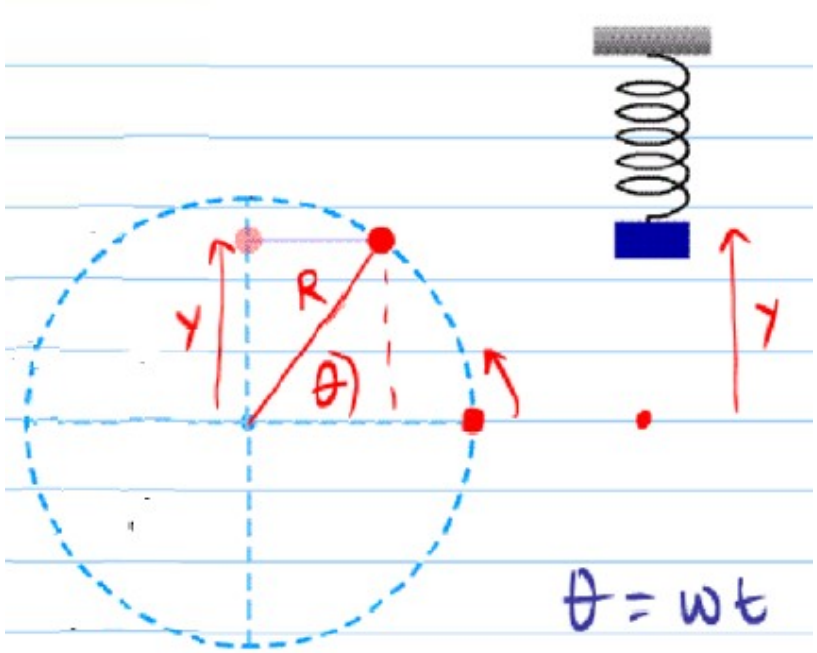


Analogy





Superposition of Waves



Amplitude:

Periode:

$$t = \frac{\theta}{\omega}$$

$$T = \frac{2\pi}{\omega} \Leftrightarrow \omega = \frac{2\pi}{T}$$

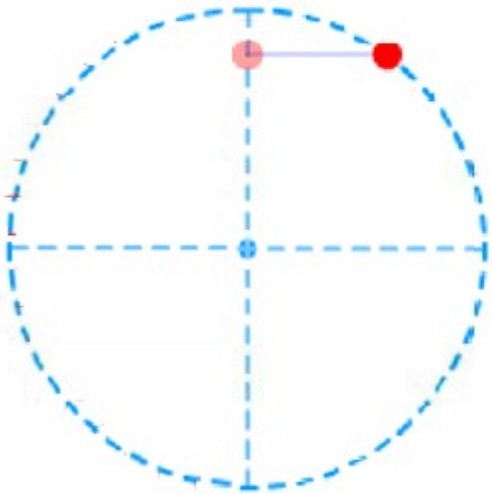
$$f = \frac{1}{T}$$

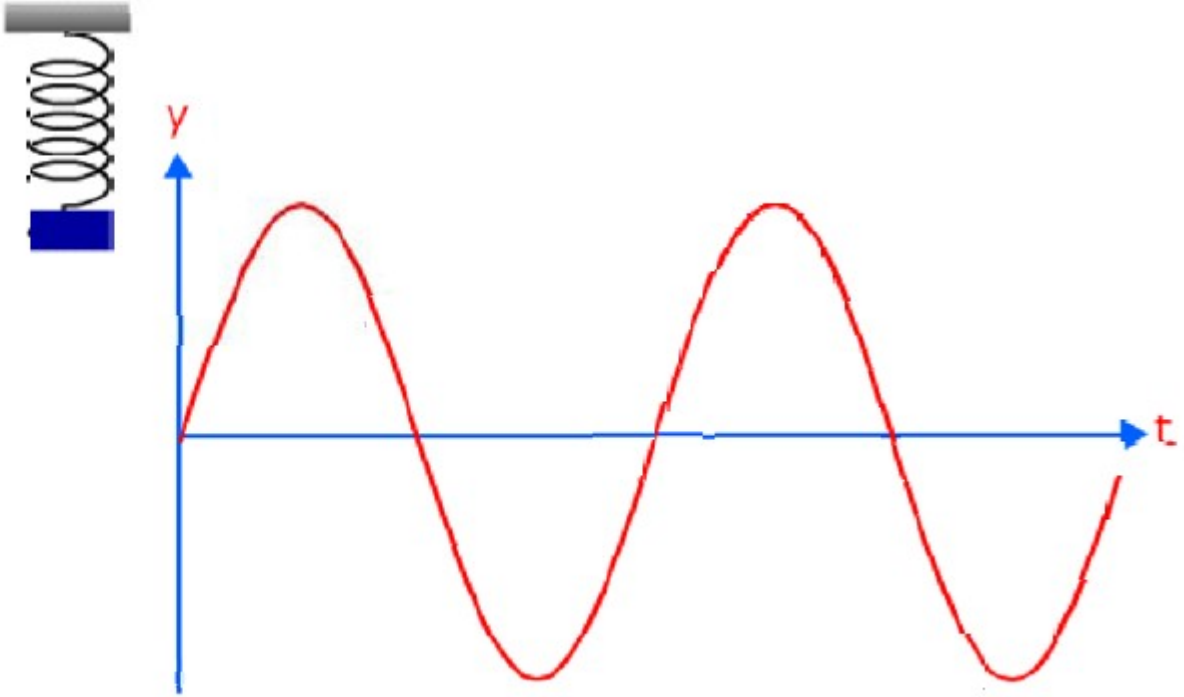
$$y = R \sin\theta$$
$$= A \sin\theta$$

$$y = A \sin\omega t$$

$$y = A \sin\frac{2\pi}{T} t$$

Superposition of Waves





Superposition of Waves

Superposition of Waves

THE END